



## On the usefulness of Badal optometer to stimulate accommodation

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**Purpose:** to analyze the performance of the Badal optometer for monocular accommodative stimulation by comparison with stimulation by means of real space targets.

**Methods:** Accommodation was stimulated at 5.00 D by means of push-up method with an open-field real space target (configuration 1) and a closed-field Badal optometer with reduced field of view (2.5 degrees) and without depth cues (configuration 2). Moreover, 3 more configurations were used to isolate the effect of: stimulation method (real vs. Badal targets), field of view (2.5 vs. 15 degrees) and peripheral interposition of targets in depth (empty vs. depth cues). The accommodative response (AR) was measured with the WAM-5500 autorefractometer.

**Results:** 28 eyes of 28 subjects were included in the study, with a mean age  $\pm$  standard deviation (SD) of  $24.29 \pm 2.12$  years (18 to 27 years), monocular corrected visual acuity of  $-0.14 \pm 0.06$  logMAR ( $-0.20$  to  $0.02$ ) and subjective amplitude of accommodation of  $9.47 \pm 1.91$  D ( $7.14$  to  $15.38$  D). The repeated measures ANOVA showed statistically significant differences in the AR among configurations ( $p < 0.05$ ). The Bonferroni post-hoc tests comparing real (configuration 1) versus Badal optometer (configuration 2) showed a mean AR difference  $\pm$  SD ( $p$ -value) of  $0.58 \pm 0.53$  D ( $p < 0.05$ ). The AR difference due to the different variables was: stimulation method  $0.11 \pm 0.48$  D ( $p = 1.00$ ), field of view  $0.13 \pm 0.43$  D ( $p = 1.00$ ) and interposition of targets in depth  $0.29 \pm 0.36$  D ( $p < 0.05$ ).

**Conclusions:** AR can differ significantly when stimulated by means of push-up method with open-field real space targets and a closed-field Badal optometer. However, our results suggest that stimulation method by itself is not enough to achieve significant differences. Other factors as field of view and the interposition of objects in depth play a role to explain these differences. In this sense, Badal optometers including larger fields of view and the interposition of objects in depth could improve the AR up to acceptable differences.

**Layman Abstract (optional):** Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.: